Compatibility board for R/C tanks equipped with IR Battle System

Use and Installation Manual

Issue 1.2

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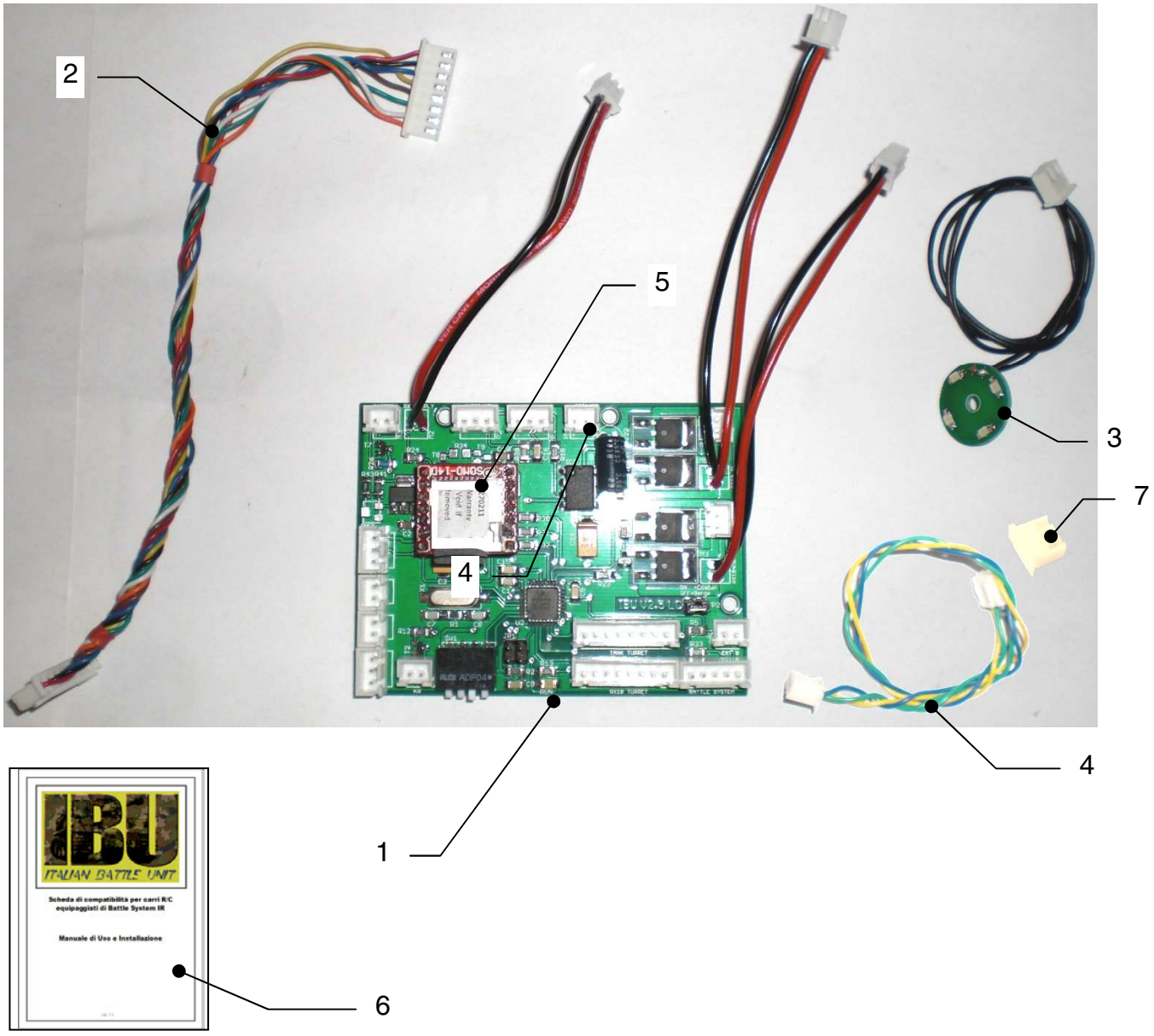
Use and Installation Manual

1. INTRODUCTION

The Italian Battle Unit (hereafter addressed as I.B.U.) is an exclusive electronic board which allows to equip one's RC IR vehicle with a Tamiya[tm] compatible battle system (such as the Tamiya Battle Unit or TBU), and in addition to introduce many other features described in the following pages.

2. CONTENTS OF THE BOX

In Fig. 1 it is shown the contents of the I.B.U. board box.



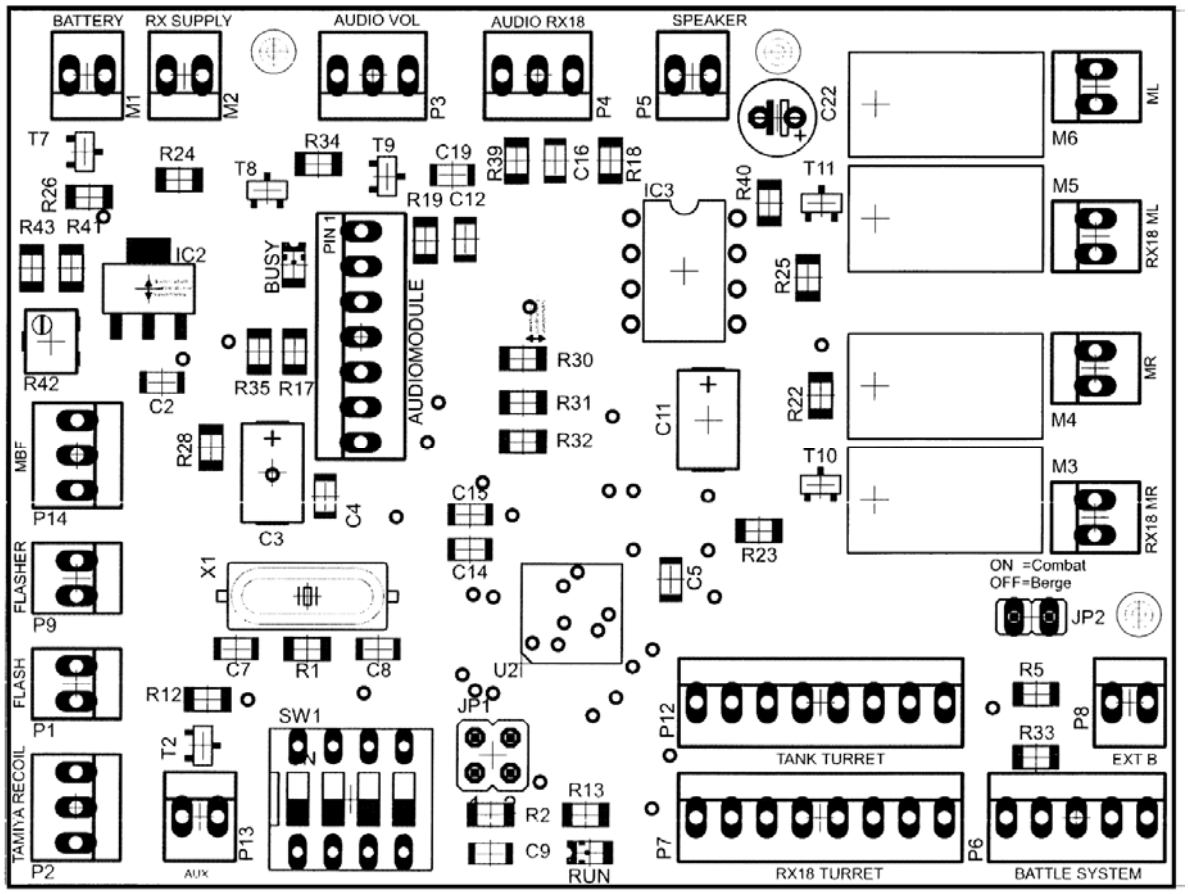
1. Main board Italian Battle Unit
2. Eight-wires cable (to connect P12 on the I.B.U. to the upper hull of the tank)
3. Signalling leds ('Flasher') for the IR receiver
4. Three-wires cable for sound (to connect P3 on I.B.U. with CN4 VR on RX18)
5. Sound module with micro SD card (if included in the bought version)
6. This manual (if foreseen in print form in the bought version, otherwise as a PDF)
7. Three-wires connector to modify the cable between I.B.U. and tank hull

Note: colors may be different.

Fig. 1 Contents of the Italian Battle Unit box

3. SPECIFICATIONS

In Fig. 2 it is shown the layout of plugs and selectors on the I.B.U.



M1 Battery	To battery
M2 RX Supply	Cable (red/black) for CN1 BAT on the RX18
P3 Audio Vol	Volume knob
P4 AUDIO RX18	Audio cable (3 wires) from CN4 VR (#4 di Fig. 1)
P5 SPEAKER	Speaker output
M6 ML	To left motor
M5 RX18 ML	Cable to CN6 M.L.
M4 MR	To right motor
M3 RX18 MR	Cable to CN7 M.R.
JP2	Shooting range selector (closed: maximum range for battling tanks, open: minimum range for repair tanks)
P8 EXT B	External trigger (not supplied)
P6 Battle System	Heng Long battle system plug
P7 RX18 Turret	8 wires cable from CN9
P12 Tank turret	8 wires cable (supplied, #2 of Fig. 1), to upper hull connector.
JP1	RESERVED: ATTENTION, DO NOT CONNECT ANYTHING!
SW1	Dip switch for setting vehicle type, weight class, recoil unit type
P13 AUX	Collector for external relay (not supplied)
P2 Tamiya recoil	Tamiya or standard servo recoil (not supplied)
P1Flash	Flash led (to simulate muzzle flash or soldering flashes)
P9 Flasher	Red leds of the IR receiver
P14 MBF	Minefield Simulator plug (under development)

Fig. 2 Layout of I.B.U. board

3.1 Tamiya compatibility tailored for Heng Long tanks

The board supplies an RC tank the following features:

- Full Tamiya TBU compatibility of the IR system, both in receival and transmission (receival range depends solely from the receiver apple adopted, variable between ~17 and ~31 meters).
- Weight class selectable: light (3 hits), medium (5 hits), heavy (9 hits) through DIP switch.
- Tank is slowed when hit, according to Tamiya specs, but set for Heng Long stock mechanics and electronics, and optimized for heavy surfaces.
- Gun reload simulation according to tank weight class selected, as for Tamiya specs.
- Hit signalled by 4 red leds supplied already mounted on a plate
- Muzzle flash led control to simulate shooting.

3.2 Plug & play installation with RX18 boards

On a Heng Long tank with RX18 board, installation is plug&play: no soldering required. The Heng Long battle system is used.
An installation guide is described later in this manual.
For tanks with different electronics (e.g. RX13-14 or different brands) contact the supplier for assistance.
Installation on other electronics requires a good lever of experience, therefore it is recommended to perform it only under the assistance of the supplier.

3.3 New feature: damaged tank repair

Through a DIP switch setting, it is possible to simulate a recovery tank ('Bergepanzer'), capable of repairing damaged and slowed tanks, provided they are too equipped with the I.B.U. board.

3.4 Additional sound effects

Through an optional sound module it is possible to change the standard Heng Long shooting sound with a custom one, and to add sounds for tank hit, destroyed, resurrection and a sound for the new feature: **tank under repair**.
In absence of the optional sound module, the above described functions are however signalled by led and flash light effects.

3.5 Gun reload signalling

At the end of the reload (from 3 seconds for a light tank, to 9 for a heavy one), the additional red leds blink shortly (about ½ second) to inform that it is possible to shoot again.

3.6 Barrel recoil is inactive during reload time

By modifying the cable connecting RX18TURRET (on the I.B.U.) and the tank upper hull, using the supplied 3 poles connector, it is possible deactivate barrel recoil and muzzle flash during reload times (see installation procedure).

3.7 Tamiya or standard servo recoil

By connecting the recoil unit in plug P2 (NEG on top), it is possible to synchronize a barrel recoil (using a Tamiya or standard servo mechanism) with the gun shooting.

3.8 "Standalone" installation

The I.B.U., operating independently from the Heng Long electronics, can be installed also as standalone, for instance to simulate a fixed anti-tank gun emplacement, a bunker or a repair workshop.
The board can be directly connected to a battery pack, and the battle system can be operated manually, through a pushbutton or using a proportional transmitter, operating the pushbutton through a servo, for example.
Kepp an eye on CARRI RC forum (www.carrirc.com) for ideas and examples from some of the best R/C tank italian modelers.

3.9 Minefield simulator

The I.B.U. introduces support for a brand new feature for 1/16th scale, the 'minefield simulator'.
By equipping the optional kit 'Minefield simulator', connected to the dedicated plug P14 MBF and positioning the magnetic sensor on the bottom of the hull, the vehicle is damaged when moving above a 'landmine'.
This accessory is in development and will be available soon.

3.10 Software update support

The board software can be updated by sending it to the developer. It will be therefore possible to introduce optimizations and new functions without changing the hardware.

4. PRE-INSTALLATION

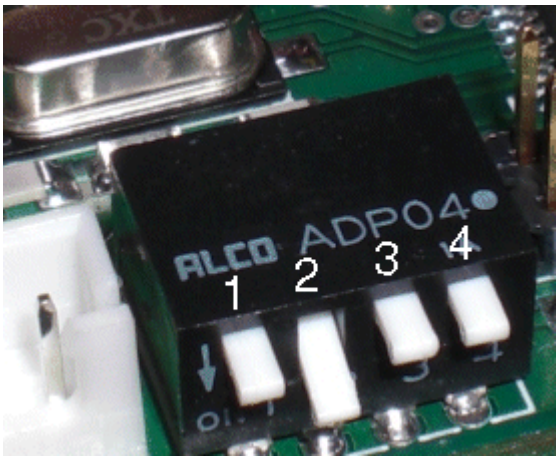
Before proceeding with installation it is better to set the tank parameters according to the vehicle the board is about to be equipped on.
This is made through two simple settings described hereafter.

4.1 IR range setting

Jumper JP2: with jumper inserted (default) the shooting range of the IR led will be the maximum (battle tank), while with jumper removed, the shooting range will be limited to a couple of meters maximum. This feature has to be paired with the 'repair tank' setting (by Dip Switch, see next paragraph) to avoid repairing unwanted or very far tanks, or even enemy ones!

4.2 Function and weight class

Using Dip switches it is possible to set the weight and function (battle or repair tank) of the vehicle, according to the following table (ON is bottom, OFF is top):



Tank function:	**Dip switch nr. 1**
Battle tank	ON
Repair tank	OFF

Weight class:	**Dip switch 2**	**Dip switch 3**
Ultralight (1 hit)	ON	ON
Light (3 hits)	ON	OFF
Medium (5 hits)	OFF	ON
Heavy (9 hits)	OFF	OFF

Recoil type selection	**Dip switch 4**
Recoil Tamiya type	ON
Recoil through standard servo	OFF

Fig. 3 DIP switch settings

4.2.1 Weight class table

This is a table with some standard weight class settings for some r/c tanks found in commerce:

Tank	Weight class
King Tiger (Tiger II)	Heavy
Tiger	Heavy
Sutrmtiger	Heavy
Pershing	Heavy
KV-2	Heavy
KV-1	Heavy
Elefante	Heavy
Jagdpanther	Heavy
Panther	Heavy (also Medium)
T34/76	Medium
T34/85	Medium
Su-85	Medium
Su-100	Medium
Panzer IV F1/F2/J	Medium
Sherman	Medium
Stug IV	Medium
Stug III	Medium
Panzer III	Light (also Medium)
M41 Bulldog	Medium
M1 Abrams	Heavy
Leopard 2 A5/A6	Heavy

The table above can be used as a reference also for 'repair tank' versions derived from the same battle tank. (e.g. Bergepanzer III → Light).

5. STANDARD INSTALLATION

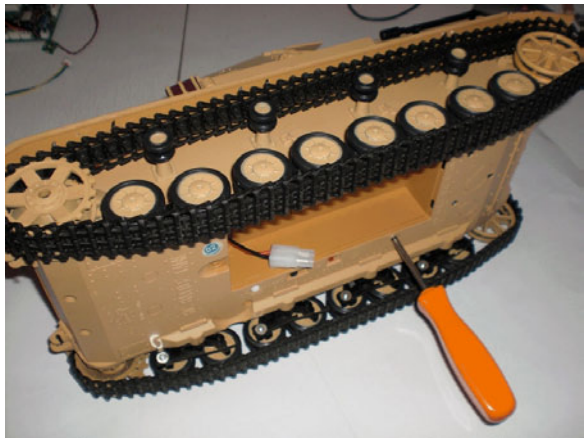
CAUTION! **A wrong installation can damage both the I.B.U. and the tank! We take no responsability for wrong installation or performed by unqualified people. If the present instructions are not clear, pease contact the producer for an installation quotation.**

CAUTION! **The I.B.U. board contains components which can be damaged by electrostatics: use an electrostatic bracelet to prevent damages to the components.**

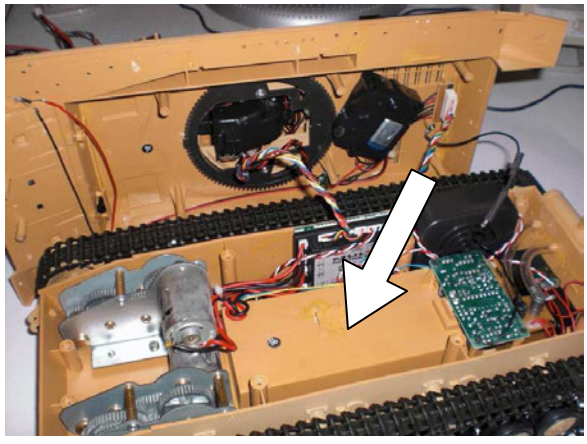
MAKE REFERENCE TO Fig. 2

1) Open the battery vane (by hand or with a screwdriver) and disconnect the battery, for safer operating.

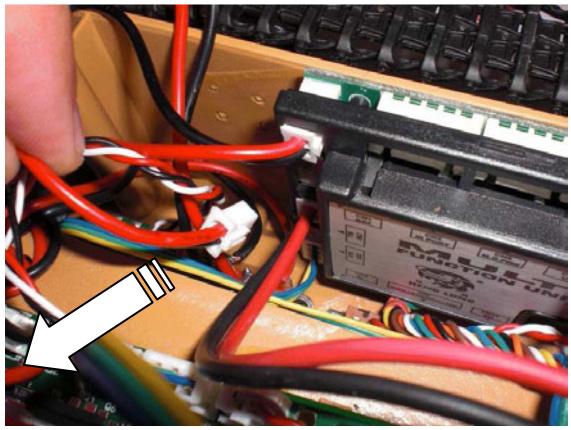
2) Open the tank hull by unscrewing the screws holding the upper and lower hulls together and open the tank. Be careful to avoid tearing the inner wires.



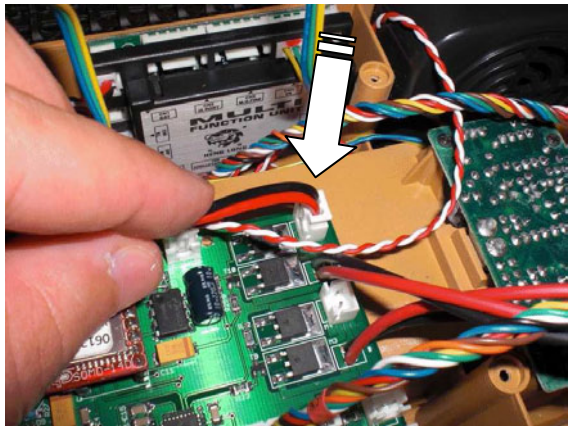
3) Choose a place to put the I.B.U., in order to avoid contact with other metal and electric parts inside the tank, and to allow an ordered disposition of the connection wires. A possible location might be above the battery box.



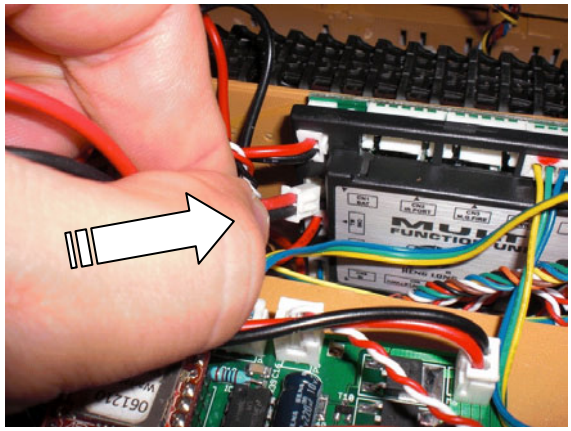
4) Extract the two-wires cable (red/black) connecting one of the motors to the CN6 M.L. plug of the RX18 board



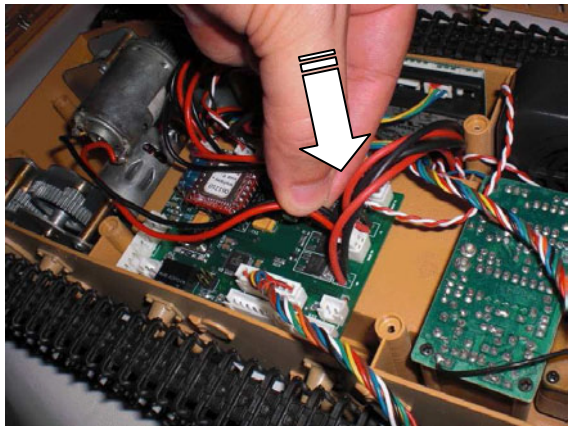
5) Insert the cable on the M6 ML plug of the I.B.U..



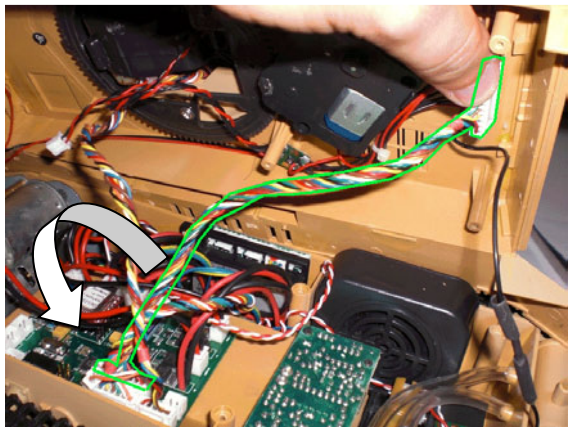
6) Get the M5 wire next to the M6 plug and insert it into the CN6 M.L. plug of the RX18 (the position lef free in step 4).



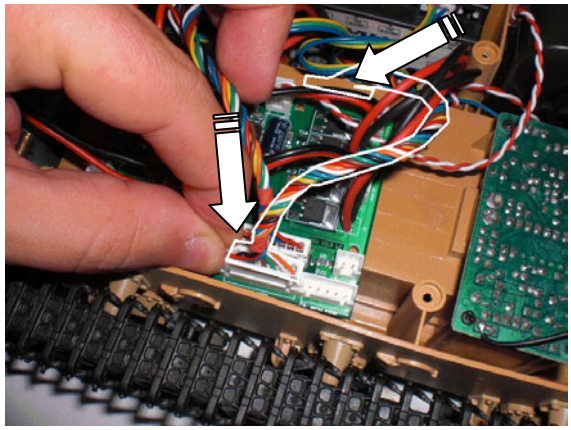
7) Repeat for the other motor: extract the wire from the CN7 M.R. plug of the RX18 and inserti it into the M4 plug of the I.B.U., then connect the nearby cable M3 into the CN7 plug on the RX18.



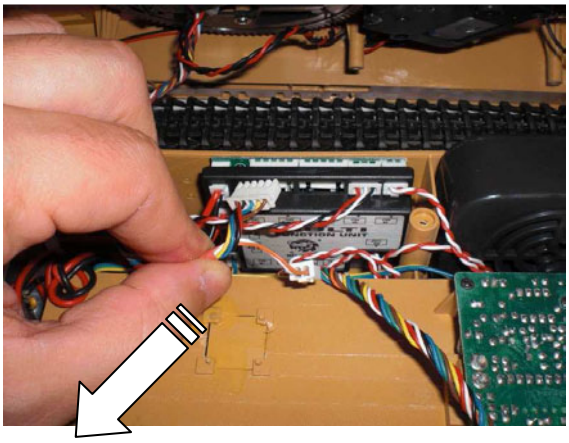
8) Disconnect the 8 wire multicolor cable from plug CN9 on the RX18 and insert it into the I.B.U. plug ‘P12 Tank turret’.



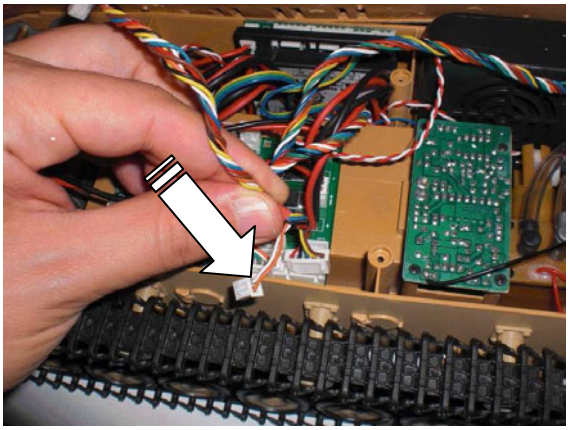
9) Insert the 8 poles wire (supplied, #2 of Fig. 1) into plug P7 RX18 Turret of the I.B.U. and connect it to plug CN9 on the RX18.



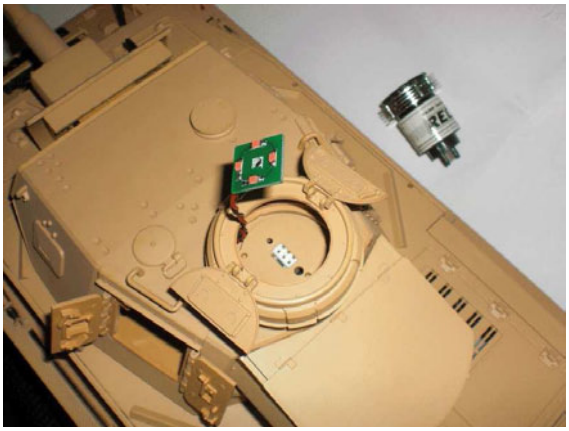
10) Disconnect the Battle System cable from plugs CN2 (5 wires) and CN3 (2 wires) of the RX18…



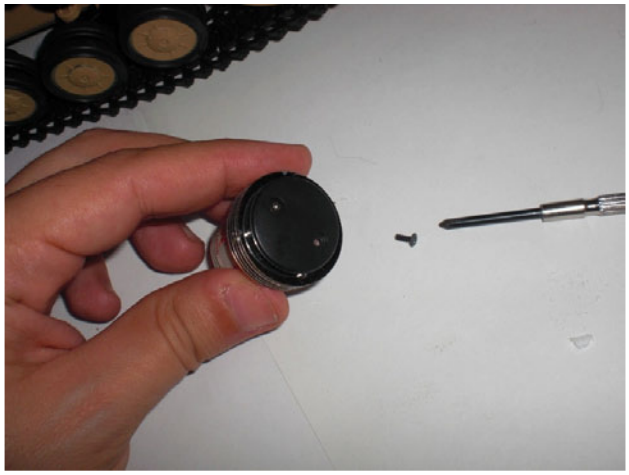
…and insert only the 5 wire cable on I.B.U. plug P6 Battle System.
If the I.B.U. is NOT equipped with a sound module, leave the cable connected to CN3 (2 wires, the one coming from the recoil unit), in order to not retain the 'boom' sound when shooting.
If the I.B.U. is equipped with a sound module, leave the 2 wire cable from plug N2 disconnected.

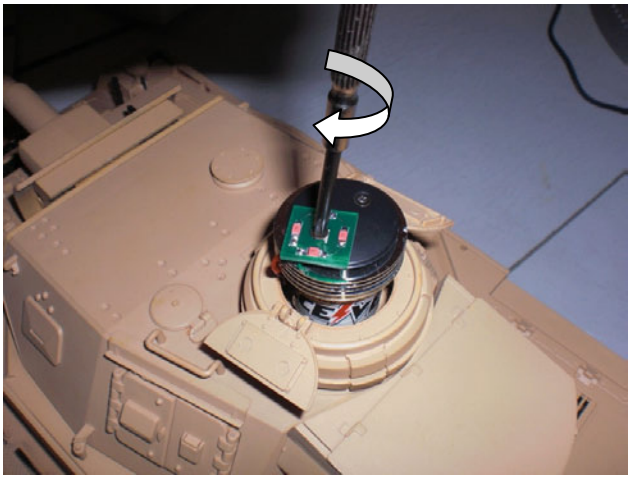


11) Slide the Flasher cable (#3, Fig. 1) through the turret.



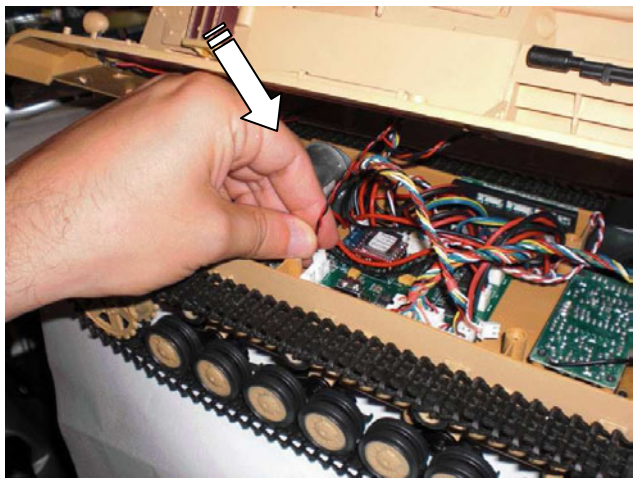
12) Secure the led plate with double tape or with one of the two screws removed from the top of Heng Long receiver apple, or in any position clearly visible from distance.





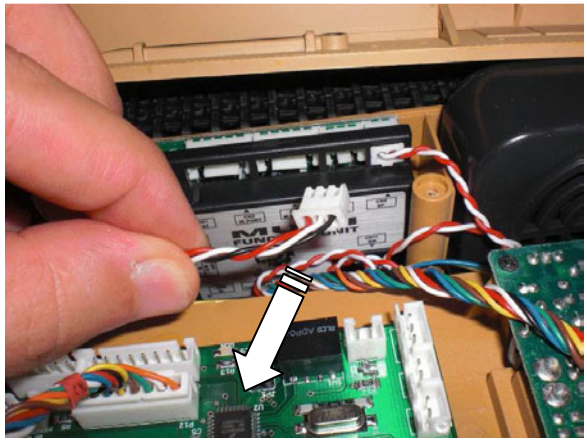
Insert the Flasher cable in plug P9 Flasher of the I.B.U..

CAUTION!
DO NOT NON MIX PLUG P9 “FLASHER” WITH PLUG P1 “FLASH”!

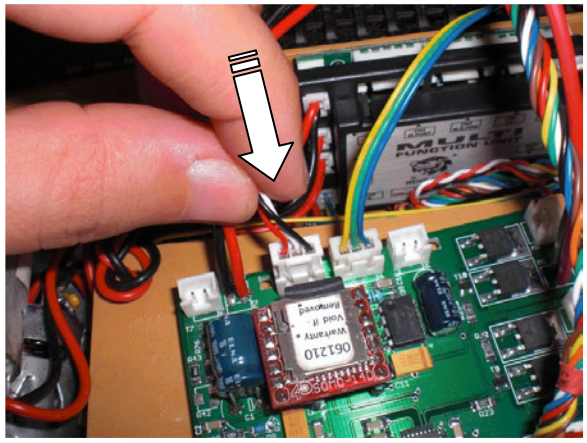


13) Connect any flash led (if present, not supplied) in positoin P1 Flash.

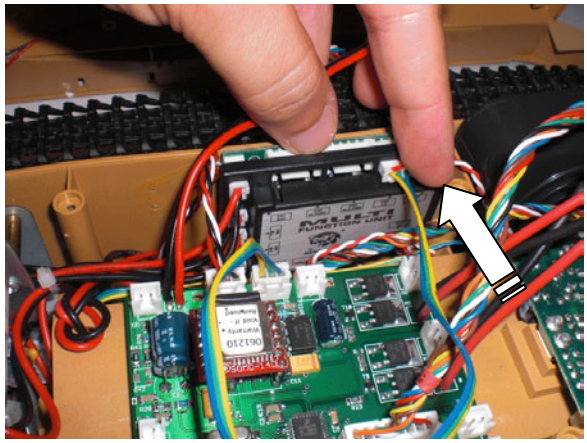
14) Disconnect the volume knob cable from plug CN4 VR of the RX18.



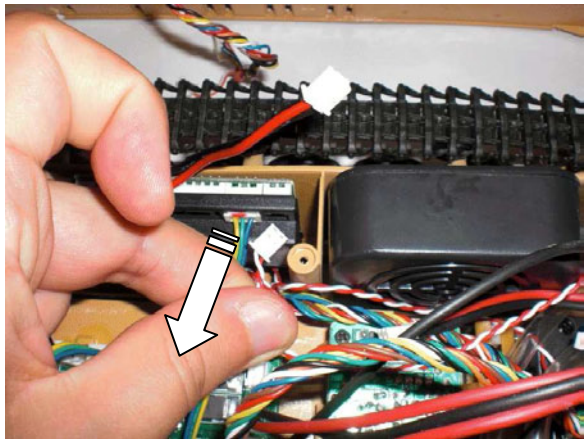
15) Insert the volume knob cable into plug P3 Audio Vol of the I.B.U..



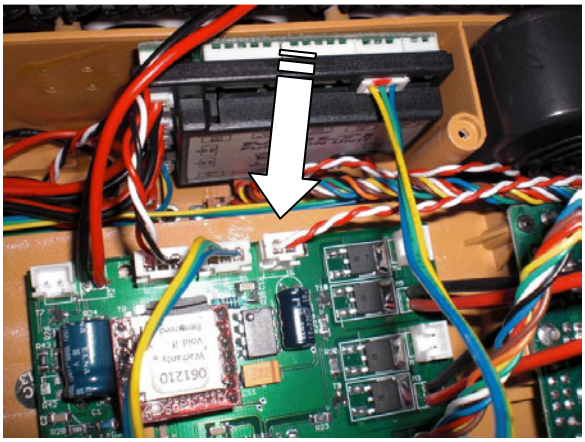
16) Conenct with the 3 wires cable (supplied, #4 of Fig. 1) the plugs P4 AUDIO RX18 on I.B.U. and CN4 VR on RX18.



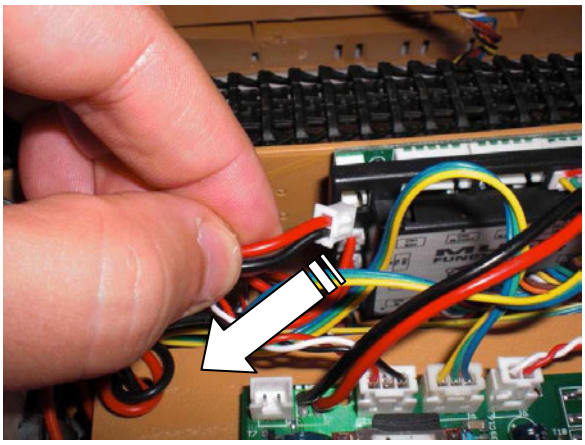
17) Disconnect the speaker plug from the RX18.



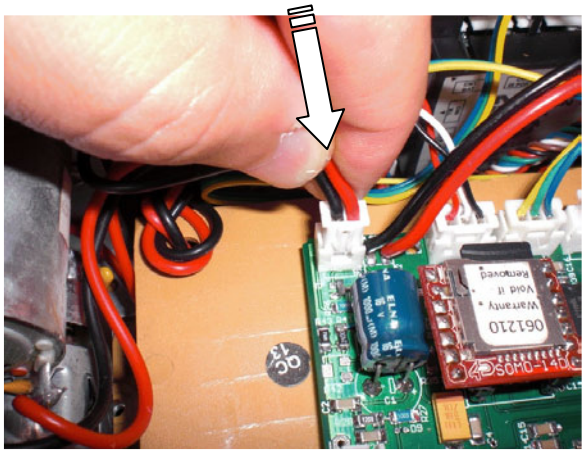
18) Connect the speaker plug to the plug P5 Speaker on the I.B.U..



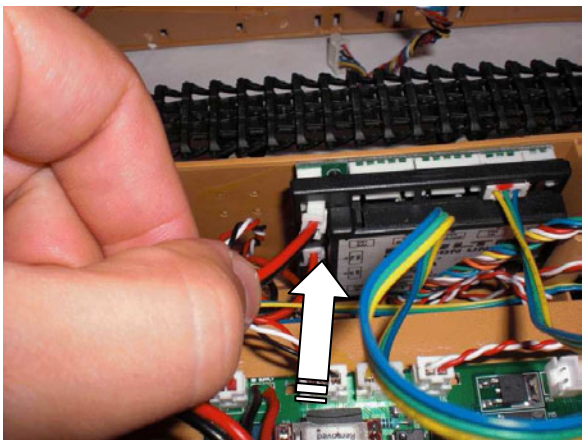
19) Disconnect the power supply cable from plug CN1 BAT of the RX18.



20) Insert it into plug M1 Battery Supply of the I.B.U..

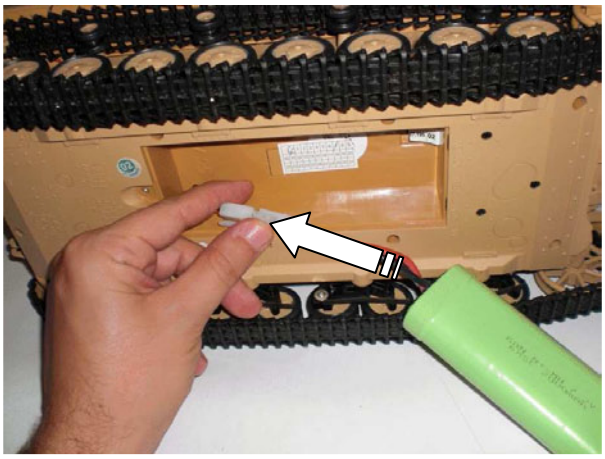


21) Connect the nearby cable M2 from the RX18 into plug CN1 BAT.



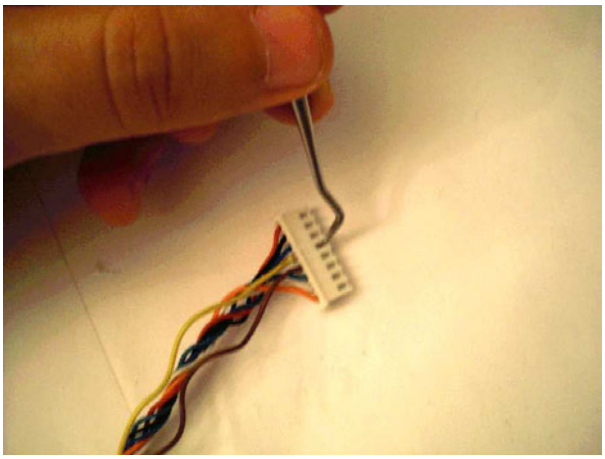
22) Position all wires as clear as possible, and position the upper and lower hull upon each other until a correct installation is aquired, which must allow to correctly close the tank without pinching any wire. A summary diagram of all the connections between RX18 and I.B.U. is shown in Fig. 4.
Insert and screw at least 2 scews to keep the hulls together.

23) Reconnect the battery and switch the tank on to verify that the red led of the Flasher do light up briefly (the green led 'RUN' on the I.B.U. stays lit). Test the different tank functions (tracks movement, turret rotation, barrel elevation, shooting).

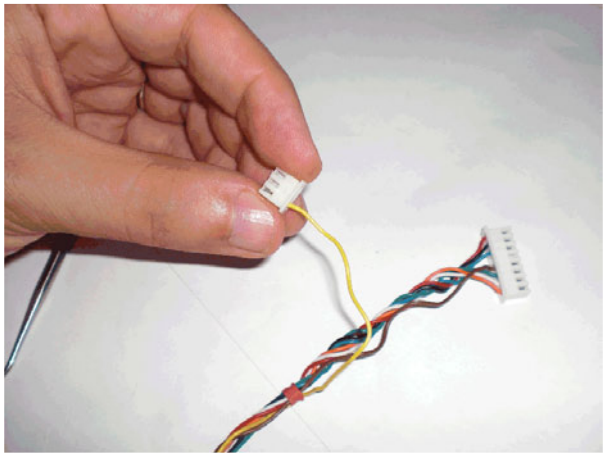


24) When everything works fine, turn off the tank and proceed to modify the 8 wire cable connecting the I.B.U. and the upper hull.

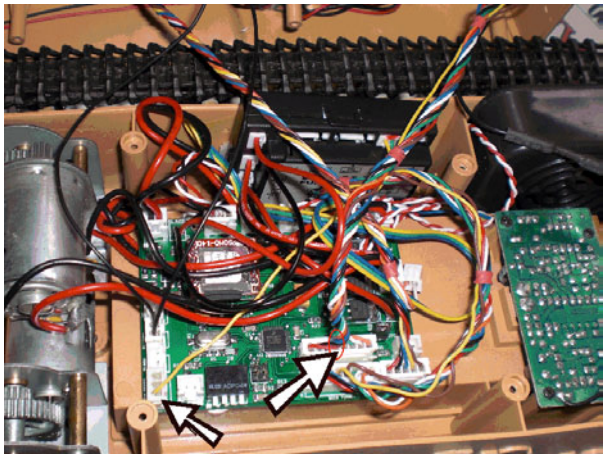
25) Disconnect the cable from the P12 position on I.B.U. and, using a pointed tool, press on the lock tab of the recoil command wire, which is the 4th from the left (usually correspondant ot a yellow cable, if it was assembled correctly).
Unwind the cable if necessary, in order to free it for the needed lenght.



26) If needed, using a blade bend again the locking tab on the wire terminal, then insert and lock it into the 3 position connector (supplied), in the shown position (when inserted, the wire must be in the lower most position on P2, Fig. 2).



27) Re-insert he 8 wires cable on P12 (I.B.U.) and insert the 3 poles connector in P2 Tamiya recoil, verifying that the cable is connected to the lower pin. Check that DIP Switch #4 is in ON position.
Now it is possible to shoot by giving a short push to the left stick: the I.B.U. will play the sound effect, shoot the IR signal and drive the barrel recoil, and then it will lock it during the reload time.



28) Complete the hull fixation by inserting all the screws.

29) The I.B.U. installation is finished: congratulations!

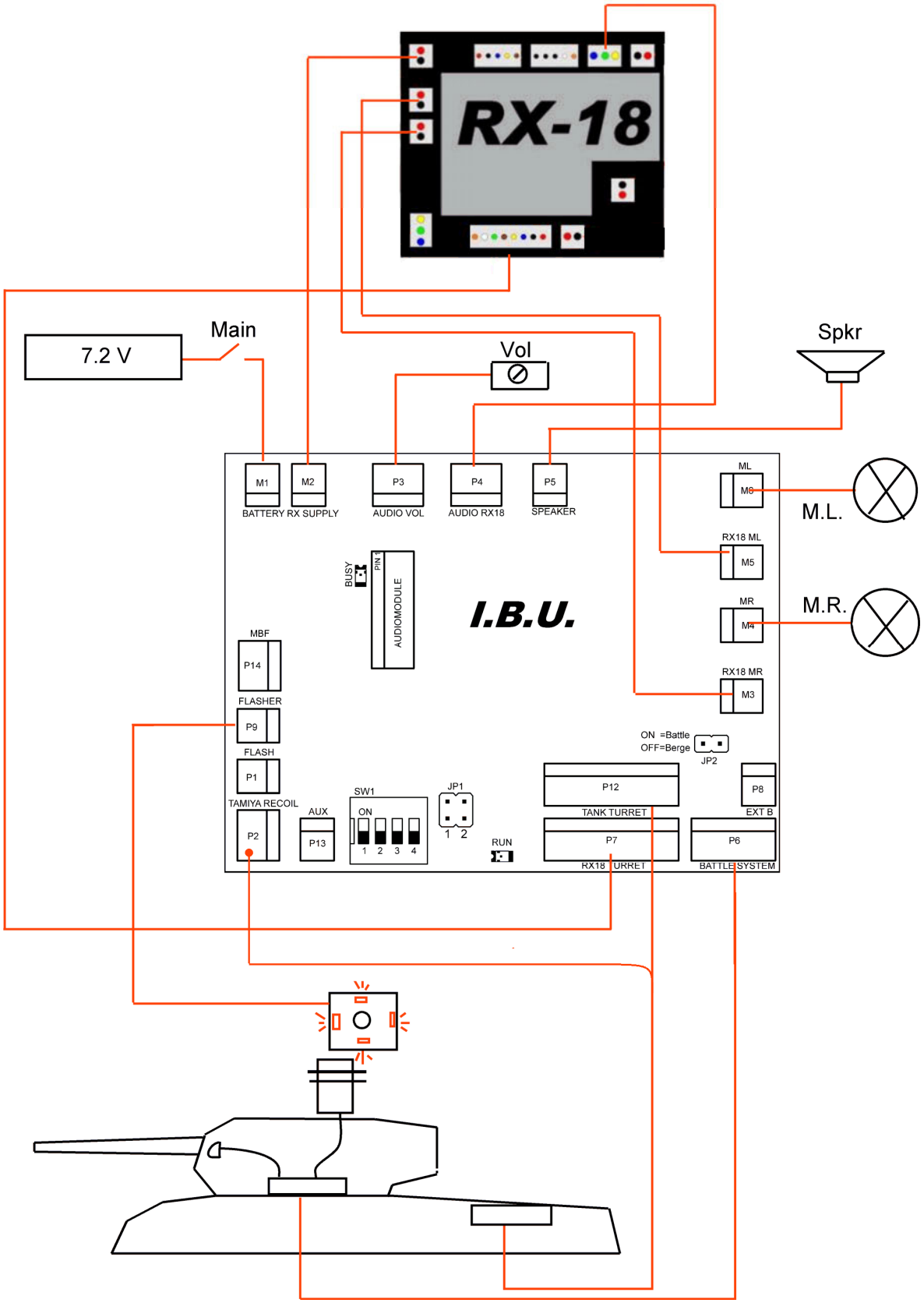


Fig. 4 Connections diagram bewteen RX18 and I.B.U.

6. ‘STANDALONE’ INSTALLATION

The I.B.U. has been designd also to operate in ‘standalone’ mode, to allow building special projects, such as fixed anti-tank gun emplacements.
Such installation (described in diagram of Fig. 5) is simple, since it only needs the following connections:

- Battery (7.2-9.6V) connected to M1 Battery plug (Fig. 2)
- An I.R. led and a receiver (not supplied) connected to plug P6 Battle System
- A flash led connected to plug P1 Flash
- The Flasher red leds plate (supplied) connected to plug P9 Flasher
- A volume knob (not supplied) connected to plug P3 Audio Vol
- A speaker (not supplied) connected to plug P5 Speaker

To control the shooting, connect a trigger pushbutton (or microswitch, not supplied) to plug P8 Ext B.

Selection of function and weight class of the fixed emplacement is the same as for the tanks (see chapter 4).

A suggestion to correctly set the weight class of a fixed emplacement might be as follows:

- Anti-tank infantry weapon
  (e.g. soldier with bazooka or panzerfaust) — Ultra-light (1 hit)
- Trenched or camouflaged gun emplacement — Light (3 hits)
- Bunker or shelter emplacement — Medium (5 hits) or Heavy (9 hits)

7. CUSTOM INSTALLATIONS

Behind the installations described, it is possible to use the I.B.U. in many other installations, fitting it to different brands of R/C tanks such as Torro, Matorro, Mato Toys, WSN, etc..
Just please be careful not to supply a higher than suggested voltage to the I.B.U., meaning a maximum of 9,6V (8 cells).
For such installations however it is suggested to contact the supplier and to read forum on www.carrirc.com (or others) for informations and suggestions.

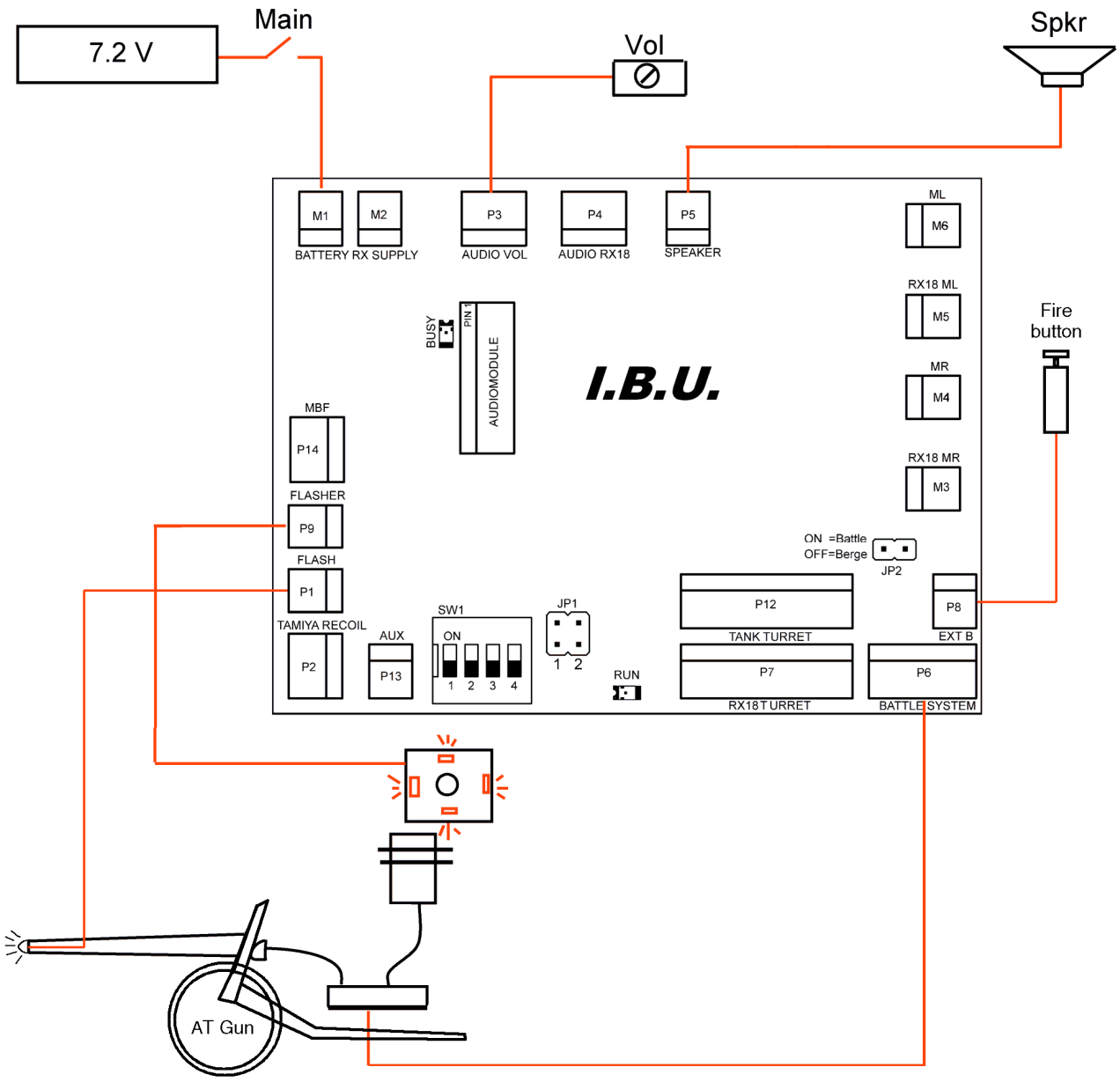


Fig. 5 ‘Standalone’ installation example

8. USE

8.1 Battling

Switch on the tank and start the engine using the 'key' button on the Heng Long transmitter.
Try to drive the tank: it has a better manovrabilità and a small ramp while accelerating and braking, which allows a longer duration of its mechanical parts (gearboxes and tracks).
Push the left stick to shoot: you can hear the 'boom' sound and see a flash led)if any in the barrel) and the IR battle system transmits its pattern signal.
After shooting, for a time variable from 3 (light tank) and 9 seconds (heavy tank) it is not possible to shoot again (reload interval). At the end of the reload interval, the red leds of the Flasher blink once, to let you know that the gun is reloaded and that it is possible to shoot again.
When the tank is hit by a Tamiya compatible IR signal, the red leds of the Flasher stay lit for about 3 seconds, and the motors might be slowed according to Tamiya specs.
One hit point is subtracted from the tank total.
If the tank does receive the final hit, the I.B.U. switches the RX18 off, the red led blink for about 15 seconds and the tank must be considered 'destroyed' (if installed, the sound module does play the 'destruction' sound effect).
After 15 seconds, the 'rebirth' sound effect is played (default is a military march), power supply is given again to the RX18 (the headlights blink) and it is possible to restart the tank engine by the transmitter button.

8.2 Repair tank

If DIP switches are set in 'repair tank' mode, the tank won't be able to damage the enemy.
Instead, it will be able to restore the hit points of a damaged tank (provided it is not completely destroyed), if equipe with an I.B.U., by "shooting" him in short range the repair code through the IR led.
When using this function, the repair tank stops moving for some seconds (according to its weight class, 3, 5 or 9 seconds), and it is vulnerable to enemy shoots. At the same time, the muzzle flash led blinks to simulate a soldering light, and the repair sound effect is played. After this time it can move again into safety and take cover.
The damaged tank, if correctly hit by the IR repair signal, begins restoring its hitpoints (the process is signalled by fast blinking of the red leds), during which it cannot move nor battle. One lost hitpoint is recovered every 5 seconds (the blinking stops for a little after each recovered hitpoint). During the repair, the relevant sound effect is played.
If during the repair process the tank is hit, the repair is interrupted with recovered hitpoints, and the tank recovers movement and battling ability (if the hit did not destroy it).

When setting the vehicle as 'repair tank', remove jumper JP2 in order to reduce the repair range of the IR led to 10% of normal one. This, together with a proper positioning of the IR led, will allow to perform repair on intended allied tanks only.

NOTE: Lack of removal of jumper JP2 will allow ability to 'repair' unwillingly even tanks very far from repair tank, including enemy tanks.
NOTE 2: the repair tank cannot repair itself.

9. SELECT AND CUSTOMIZE SOUNDS

If the supplied I.B.U. is equipped with a sound module, on the supplied microSD card several sets, customized for a huge number of tanks, are available for selection.
To select a sound set suitable for own tank, proceed as follows:

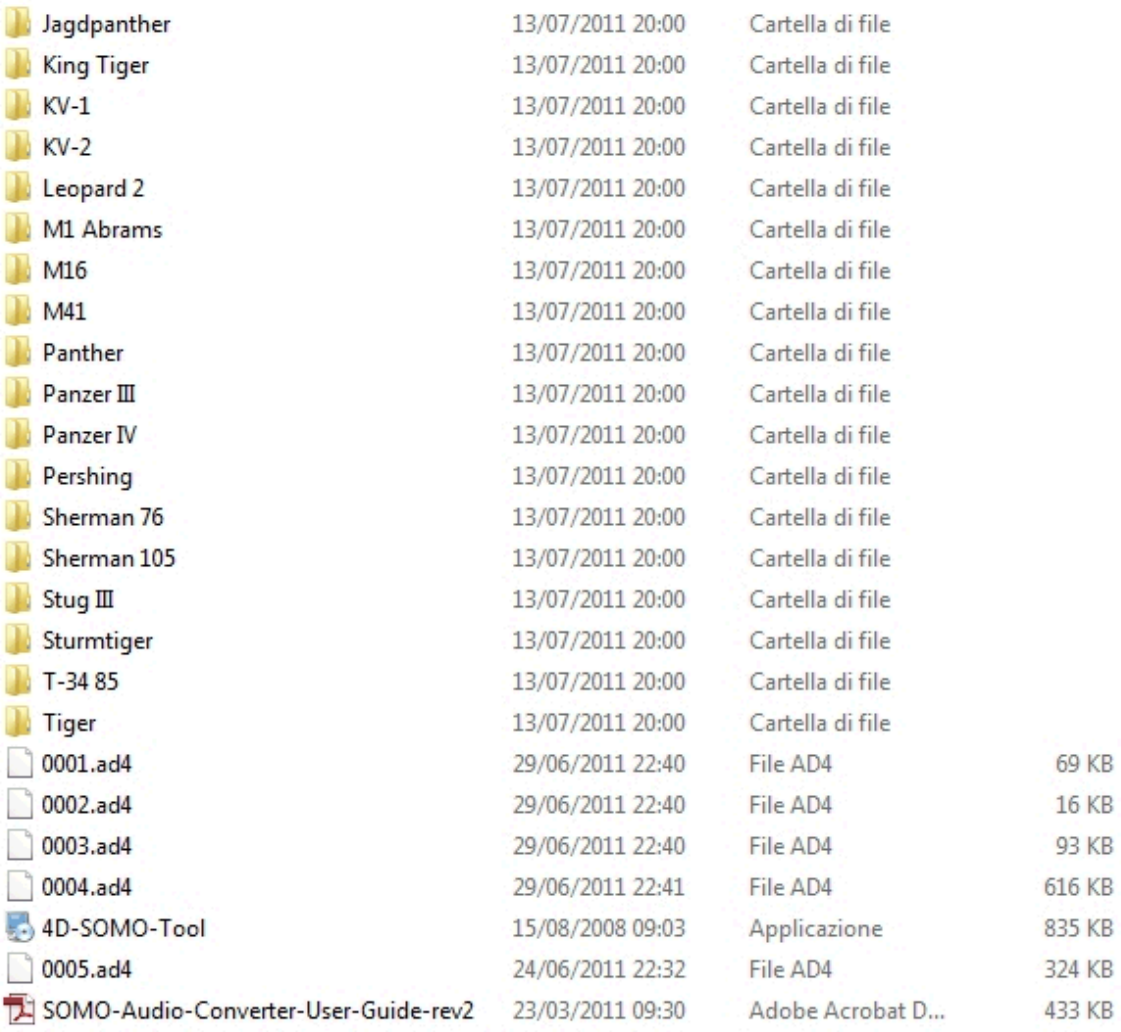
1. With tank switched off, press slightly on the microSD inserted into the sound module to unlock it (**NOTE: DO NOT PULL THE MICROSD TO UNLOCK IT!!!)**, extract and insert it into the card reader of your PC (not supplied).
2. Access and browse the contents, which will show up as in Fig. 6.
3. In the root of the card are found the following files, which are those played by the sound module of the I.B.U.

	File name	Sound effect
-	0001.ad4	Gun shoot
-	0002.ad4	Hit
-	0003.ad4	Tank destroyed
-	0004.ad4	Rebirth (march)
-	0005.ad4	Repair

In addition it is found the "4D-SOMO-Tool" software and its user manual "SOMO-Audio-Converter-User-Guide-rev2" in pdf format.

4. To select the suitable sound set for your own tank, just enter the right folder (eg. "Panzer III") and copy the 5 files over listed (in ad4 format) into the root of the microSD card, overwriting the existing ones.
5. Extract the microSD card from the PC reader and reinsert it into the I.B.U. sound module until it locks, switch on the tank and test the newly selected sounds.

It is also possible to change the supplied sounds, converting them from any format (Wav, MP3, etc.) in AD4 format using hte free "SOMO Audio Tool" (found on the micro SD card). To install and use the convertion tool, make reference to its manual.



Jagdpanther	13/07/2011 20:00	Cartella di file	
King Tiger	13/07/2011 20:00	Cartella di file	
KV-1	13/07/2011 20:00	Cartella di file	
KV-2	13/07/2011 20:00	Cartella di file	
Leopard 2	13/07/2011 20:00	Cartella di file	
M1 Abrams	13/07/2011 20:00	Cartella di file	
M16	13/07/2011 20:00	Cartella di file	
M41	13/07/2011 20:00	Cartella di file	
Panther	13/07/2011 20:00	Cartella di file	
Panzer III	13/07/2011 20:00	Cartella di file	
Panzer IV	13/07/2011 20:00	Cartella di file	
Pershing	13/07/2011 20:00	Cartella di file	
Sherman 76	13/07/2011 20:00	Cartella di file	
Sherman 105	13/07/2011 20:00	Cartella di file	
Stug III	13/07/2011 20:00	Cartella di file	
Sturmtiger	13/07/2011 20:00	Cartella di file	
T-34 85	13/07/2011 20:00	Cartella di file	
Tiger	13/07/2011 20:00	Cartella di file	
0001.ad4	29/06/2011 22:40	File AD4	69 KB
0002.ad4	29/06/2011 22:40	File AD4	16 KB
0003.ad4	29/06/2011 22:40	File AD4	93 KB
0004.ad4	29/06/2011 22:41	File AD4	616 KB
4D-SOMO-Tool	15/08/2008 09:03	Applicazione	835 KB
0005.ad4	24/06/2011 22:32	File AD4	324 KB
SOMO-Audio-Converter-User-Guide-rev2	23/03/2011 09:30	Adobe Acrobat D...	433 KB

Fig. 6 Folders found on the microSD card

10. OPTIONAL ACCESSORIES

10.1.1 Adapter cable for TBU Tamiya/Impact

Using an adapter cable (available upon request), it is possible to use the I.B.U. with a receiver apple (TBU) from Tamiya[tm] or Impact[tm] instead than Heng Long receiver.
With such installation, it is not needed to install the Flasher led plate supplied with the I.B.U.
Make reference to the instructions supplied with the cable itself for a correct installation.
To build the cable by yourself, make reference to Fig.8.

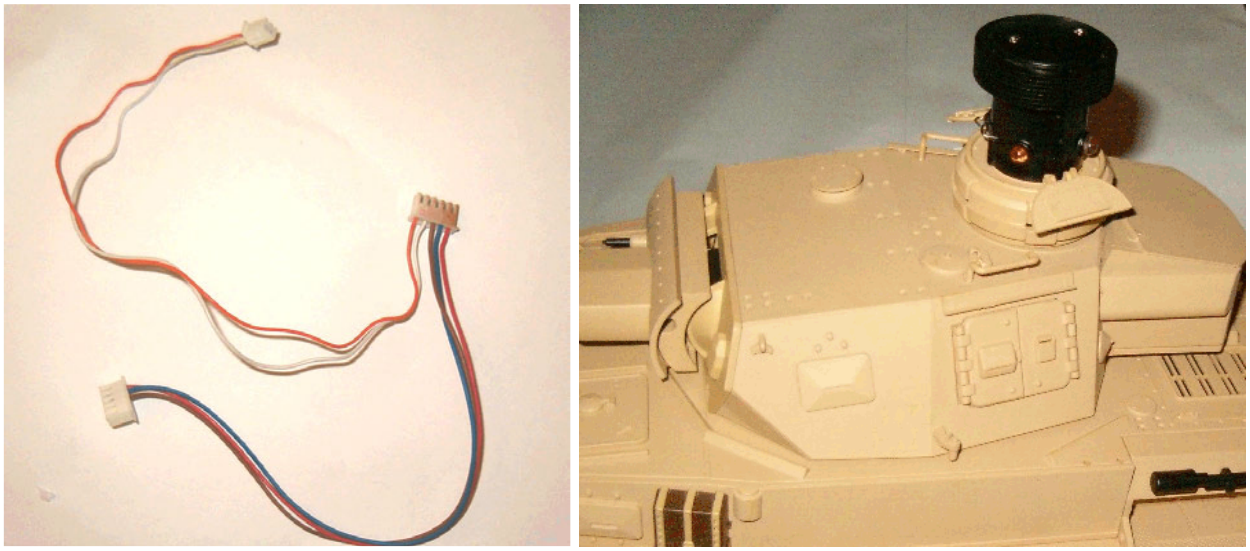


Fig. 7 Adapter cable for Tamiya or Impact TBU

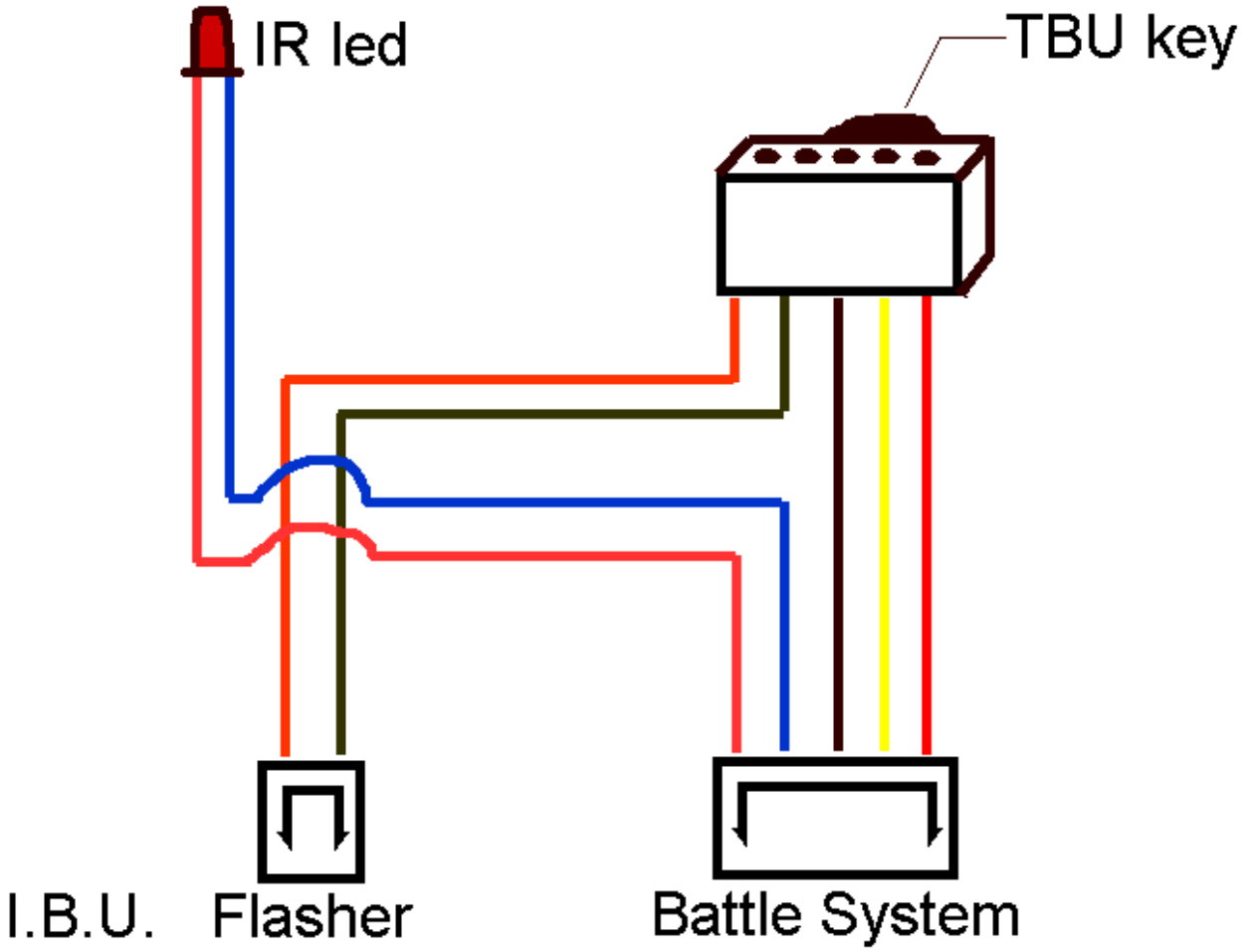


Fig. 8 Electric diagram of adapter cable for Tamiya or Impact TBU

10.1.2 Minefield Simulator kit

The I.B.U. is designed for connecting a magnetic sensor (plug P14 MBF, Fig. 2) which simulates interaction of R/C tank with land mines put on the ground.
This accessory will be available soon and it will be supplied with its own installation and use manual.